

Rao, R., K. Evans, Q.M. Ketterings, and H. Krol (2007). Madison Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-25. 34 pages.

Soil Sample Survey

Madison County

Samples analyzed by CNAL (2002-2006)



Madison County (photo credit: Kathe Evans, CCE of Madison County).

Summary compiled by

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Cornell Nutrient Analysis Laboratory

<http://www.css.cornell.edu/soiltest/newindex.asp>

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Nutrient Management Spear Program

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November 15, 2007

Correct Citation:

Rao, R., K. Evans, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Madison County. Samples analyzed by the Cornell Nutrient Analysis Laboratory (2002-2006). CSS Extension Bulletin E07-25. 34 pages.

Table of Content

1. County Introduction.....	1
2. General Survey Summary.....	3
3. Cropping Systems.....	7
3.1 Homeowner Samples.....	7
3.2 Commercial Samples.....	8
4. Soil Types.....	10
4.1 Homeowner Samples.....	10
4.2 Commercial Samples.....	11
5. Organic Matter.....	13
5.1 Homeowner Samples.....	13
5.2 Commercial Samples.....	14
6. pH.....	15
6.1 Homeowner Samples.....	15
6.2 Commercial Samples.....	16
7. Phosphorus.....	17
7.1 Homeowner Samples.....	17
7.2 Commercial Samples.....	18
8. Potassium.....	19
8.1 Homeowner Samples.....	19
8.2 Commercial Samples.....	21
9. Magnesium.....	24
9.1 Homeowner Samples.....	24
9.2 Commercial Samples.....	25
10. Iron.....	26
10.1 Homeowner Samples.....	26
10.2 Commercial Samples.....	27
11. Manganese.....	28
11.1 Homeowner Samples.....	28
11.2 Commercial Samples.....	29
12. Zinc.....	30
12.1 Homeowner Samples.....	30
12.2 Commercial Samples.....	31
Appendix: Cornell Crop Codes.....	32

Rao, R., K. Evans, Q.M. Ketterings, and H. Krol (2007). Madison Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-25. 34 pages.

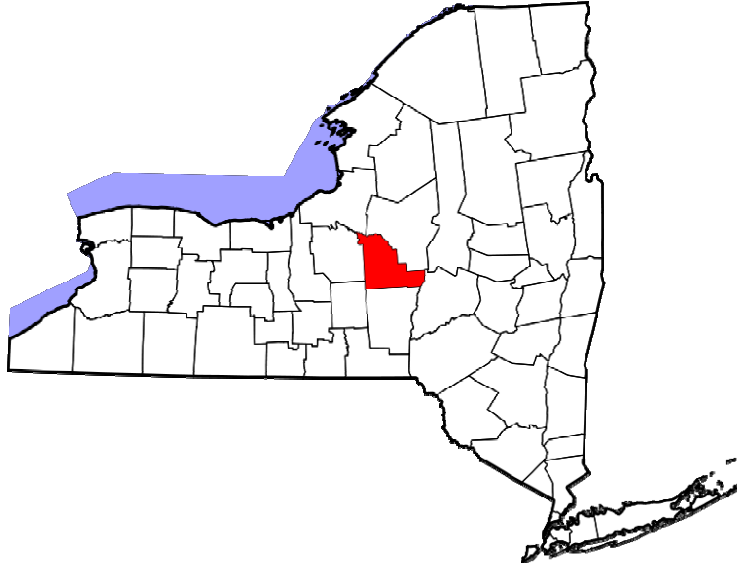


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1. County Introduction

Madison County lies south of Oneida Lake. It comprises 423,300 acres and is mainly rural in nature. The county is divided into two distinctly different physiographic areas. The



Ontario (Oneida) Lake Plain in the northern area of the county is a remnant of the prehistoric Ontario Lake. Elevation is as low as 368 ft in Canastota. This area was once a major producer of onions and now is mainly a corn growing area with some vegetables grown. The uplands of the Appalachian Plateau comprise the greatest area of the county

and is separated from the Lake plain by an east-west limestone outcropping that bisects the county.

Dairy Farming is the major commercial agriculture enterprise with about 220 farms. The crop rotation in general relies on corn and alfalfa with a limited acreage in small grains. The uplands feature an increasing number of small scale beef, sheep and goat operations that capitalize on the available open acres for grazing.

Most of the soils in Madison County are formed from glacial action resulting in deep to moderately deep soils that are steep to moderately sloping and are prominently in the upland area of the county. The major soil improvement is through artificial drainage. The lake plain area is dominated by level, moderately to poorly drained soils.

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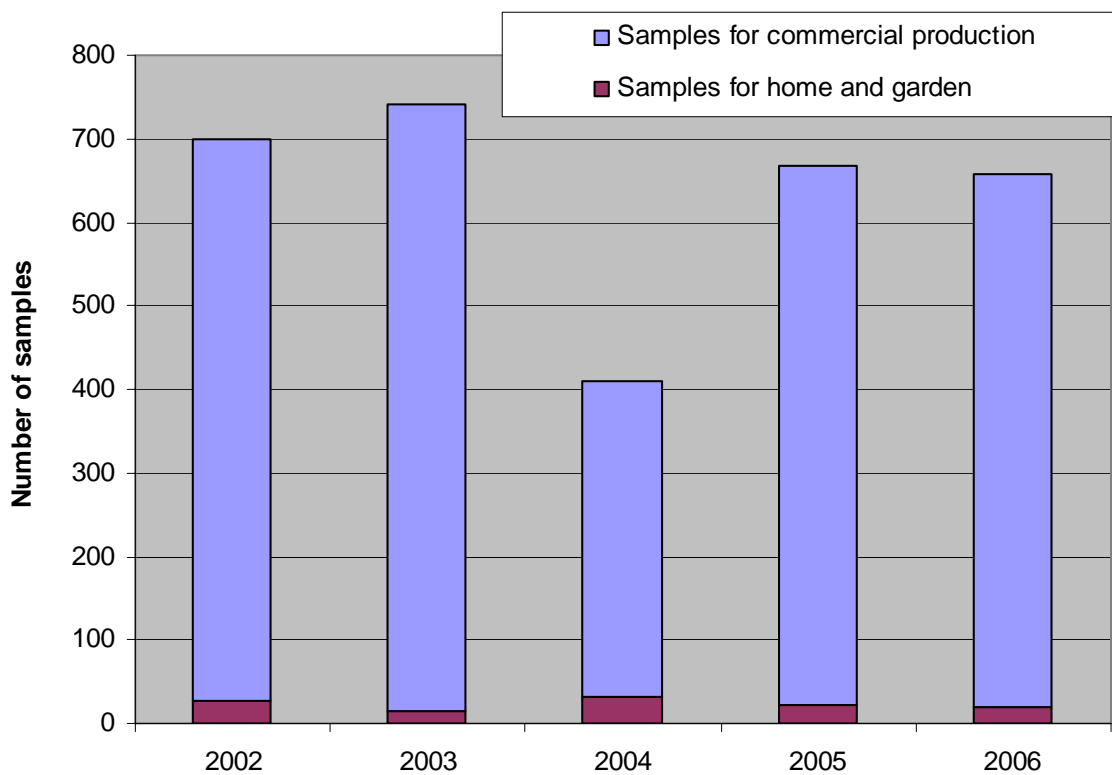
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2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Madison County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 3177. Of these, 3062 samples (96%) were submitted by commercial growers while 115 samples (4%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	27	2002	673	700
2003	15	2003	726	741
2004	33	2004	378	411
2005	21	2005	647	668
<u>2006</u>	<u>19</u>	<u>2006</u>	<u>638</u>	<u>657</u>
Total	115	Total	3062	3177

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for home garden vegetable production (38%), perennials (17%) and lawns (16%). Commercial growers submitted samples to grow alfalfa or alfalfa/grass mixes (34%), corn silage or grain (34%), and grass hay production (14%) while a few growers were planning to grow other crops.

Soils tested for home and garden in Madison County were classified as belonging to soil management group 2 (24%), group 3 (26%), group 4 (42%), or group 5 (8%). A description of the different management groups is given below.

Soil Management Groups for New York

1	Fine-textured soils developed from clayey lake sediments and medium- to fine-textured soils developed from lake sediments.
2	Medium- to fine-textured soils developed from calcareous glacial till and medium-textured to moderately fine-textured soils developed from slightly calcareous glacial till mixed with shale and medium-textured soils developed in recent alluvium.
3	Moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till.
4	Coarse- to medium-textured soils formed from glacial till or glacial outwash.
5	Coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas.
6	Organic or muck soils with more than 80% organic matter.

Of the samples submitted by commercial growers, less than 1% belonged to soil management group 1, 49% were group 2 soils, 45% were group 3 soils, 3% were from group 4, less than 1% belonged to group 5, while 2% were muck soils (group 6). Conesus was the most common soil series (21% of all samples), followed by Honeoye (13%), Lansing (10%), Mardin (10%) and Cazanovia (7%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to almost 65% (muck soil). For homeowner samples, 39% tested between 3 and 4% organic matter, 24% were between 5 and 7%, while 26% tested higher in organic matter. Of the

Rao, R., K. Evans, Q.M. Ketterings, and H. Krol (2007). Madison Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-25. 34 pages.

samples submitted by commercial growers, 60% contained between 3 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.8 to 8.4 for home and garden samples. Sixty-three percent of the samples tested between pH 6.5 and 7.9. For the commercial samples, the highest pH was 8.2 and 69% tested between pH 5.5 and 6.9.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan method (Morgan, 1941). This solution contains sodium acetate buffered at pH of 4.8.

Soil test P levels of <1 lb P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 26% of the soils tested low for P, 16% tested medium, 17% tested high and 41% tested very high. This meant that 58% tested high or very high in P. For commercial growers, 7% tested very high. In total 37% were low or very low in P, 25% tested medium for P while 30% of the submitted samples were classified as high in soil test P. This means that 37% tested high or very high in P.

Classifications for K depend on soil management group. The fine textured soils (soil management group 1) have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Classification for each of the management groups in the above table represent very low, low, medium, high and very high. So for example for soil management group 5 and 6, <60 lbs K/acre means the soil is very low in K, between 60 and 114 lbs K/acre is medium, 115-164 lbs K/acre is medium, 165-269 lbs K/acre is high and >269 lbs K/acre is classified as very high (see Table on page 6).

Potassium classifications for Madison County soils varied from very low (2% of the homeowner soils and 1% of the commercial growers' soils) to very high (50% of the homeowner soils and 34% of the commercial growers' soils). For homeowners, 10% tested low in K, 10% tested medium, and 27% tested high for potassium. For commercial growers' soils, 13% tested low, 22% tested medium and 30% tested high in K.

Soil Management Group	Potassium Soil Test Value (Morgan extraction in lbs K/acre)				
	Very low	Low	Medium	High	Very High
1	<35	35-64	65-94	95-149	>149
2	<40	40-69	70-99	100-164	>164
3	<45	45-79	80-119	120-199	>199
4	<55	55-99	100-149	150-239	>239
5 and 6	<60	60-114	115-164	165-269	>269

Soils test very low for Mg if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for Mg. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 22 to almost 19000 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (94% of the homeowner soils and 97% of the soils of the commercial growers). In total 5% of the homeowner soils and less than 3% of the commercial growers' soil tested low or medium in Mg.

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Iron levels ranged from 91-96% in the normal range with 9% of the homeowner soils and 4% of the commercial grower soils testing excessive for Fe. Similarly, most soils (93-99%) tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb Zn per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the homeowner soils, 85% tested high for Zn while 12% tested medium. Of the commercial growers' samples, 8% tested low, 32% tested medium while 59% were high in Zn.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 3.

3. Cropping Systems

3.1 Homeowner Samples

Crops for which recommendations were requested by homeowners:

	2002-2006	%
ALG	4	3
BLU	5	4
FAR	2	2
FLA	1	1
GEN	2	2
GRA	1	1
HRB	1	1
LAW	18	16
MVG	44	38
OTH	6	5
PER	7	6
RSP	1	1
SAG	20	17
TRP	2	2
Unknown	1	1
Total	115	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	4	2	0	0	1	7	0
AGE/AGT	122	222	93	133	128	698	23
ALE/ALT	92	54	28	79	81	334	11
ALG	0	1	0	0	0	1	0
BGE/BGT	5	1	6	0	0	12	0
BRP	0	0	0	1	0	1	0
BSP	0	0	0	0	1	1	0
BSS	3	0	0	7	0	10	0
BUK	0	0	0	4	0	4	0
BWI	1	0	0	0	0	1	0
CAR	0	0	0	1	0	1	0
CGE/CGT	4	0	2	19	5	30	1
CKP	1	0	0	0	0	1	0
CLE	1	0	1	0	1	3	0
COG/COS	254	229	125	217	231	1056	34
CSE/CST	2	0	1	0	0	3	0
GIE/GIT	36	19	22	9	0	86	3
GRE/GRT	45	63	33	93	113	347	11
IDL	0	2	0	1	4	7	0
MIX	0	2	1	1	1	5	0
OAS	16	24	16	11	7	47	2
OAT	2	4	0	2	11	19	1
OTH	1	23	2	7	4	37	1
PEP	1	0	0	0	0	1	0
PGE/PGT	5	8	31	1	0	45	1
PIE/PIT	39	4	2	29	9	83	3
PLE/PLT	2	44	0	1	1	48	2
PNT	17	10	5	21	23	76	2
POT	3	0	0	0	0	3	0
PUM	0	1	1	1	0	3	0
RYS	0	3	0	1	1	5	0
SOF	2	0	0	0	1	3	0
SOY	2	0	6	1	4	13	0
SSH	0	0	0	1	0	1	0
STS	0	0	1	0	0	1	0
SWC	3	0	1	1	2	7	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
TME	0	0	0	2	0	2	0
TRE	1	0	0	1	0	2	0
TRT	0	0	0	1	0	1	0
WHS	0	2	0	0	0	2	0
WHT	5	2	1	1	7	16	1
Unknown	4	6	0	0	2	12	0
Total	673	726	378	647	638	3062	100

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002-2006	%
SMG 1 (clayey)	0	0
SMG 2 (silty)	28	24
SMG 3 (silt loam)	30	26
SMG 4 (sandy loam)	48	42
SMG 5 (sandy)	9	8
SMG 6 (mucky)	0	0
Total	115	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alden	3	0	2	0	0	0	2	0
Alluvial lands	3	0	1	0	0	0	1	0
Angola	2	1	0	3	0	1	5	0
Appleton	2	10	6	4	5	16	41	1
Arkport	4	0	4	4	2	2	12	0
Arnot	3	1	3	0	0	0	4	0
Aurora	2	0	0	5	4	6	15	0
Bath	3	7	13	0	23	12	55	2
Camillus	3	12	5	3	2	9	31	1
Canadaigua	3	7	5	0	11	0	23	1
Castile	4	2	0	0	0	0	2	0
Cazenovia	2	59	54	13	38	44	208	7
Chenango	3	19	9	7	22	0	57	2
Collamer	3	1	4	1	6	7	19	1
Colonie	5	4	0	0	0	33	4	0
Conesus	2	3	9	13	11	0	69	21
Edwards	6	13	8	0	0	0	21	1
Elnora	5	4	0	0	0	0	4	0
Erie	3	5	3	0	0	3	11	0
Farmington	3	0	0	1	1	0	2	0
Fonda	2	0	1	0	0	0	1	0
Fredon	2	3	1	16	2	0	22	1
Galen	4	4	15	0	8	0	27	1
Hamlin	2	3	3	1	2	6	15	0
Herkimer	3	0	5	1	1	4	11	0
Hilton	2	1	3	3	4	0	11	0
Honeoye	2	52	113	57	45	140	407	13
Howard	3	24	29	3	29	38	123	4
Lairdsville	2	55	19	14	41	20	149	5
Lakemont	1	0	0	1	0	0	1	0
Lamson	4	1	3	1	1	0	6	0
Langford	3	0	2	0	1	7	10	0
Lansing	2	90	83	28	48	57	306	10
Lima	2	10	11	9	9	19	58	2
Lobdell	3	1	2	0	0	2	5	0
Lockport	2	4	9	0	8	0	21	1

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Lordstown	3	10	22	13	29	13	87	3
Lyons	2	0	0	0	0	1	1	0
Manlius	3	0	1	0	0	0	1	0
Mardin	3	59	67	50	101	42	319	10
Martisco	6	5	10	0	0	0	15	0
Middlebury	3	1	0	0	5	0	6	0
Minoa	4	8	2	1	7	0	18	1
Niagara	3	5	8	4	16	0	33	1
Odessa	2	6	7	4	13	4	34	1
Ontario	2	18	9	7	4	10	48	2
Ovid	2	5	4	1	1	4	15	0
Palms	6	9	21	0	0	0	30	1
Palmyra	3	42	64	34	32	23	195	6
Phelps	3	21	6	16	22	23	88	3
Schoharie	1	0	2	0	1	1	4	0
Stockbridge	3	42	14	18	26	48	148	5
Teel	2	6	21	11	14	16	68	2
Unadilla	3	1	0	0	1	0	2	0
Valois	3	1	7	0	0	6	14	0
Venango	3	0	1	0	0	0	1	0
Volusia	3	25	16	5	15	8	69	2
Wampsville	3	0	15	2	17	1	35	1
Warners	3	0	0	0	0	1	1	0
Wassaic	4	1	0	21	10	3	35	1
Wayland	2	6	3	0	2	5	16	1
Weaver	3	2	0	2	6	3	13	0
Unknown	-	4	1	1	1	0	7	0
Total	-	673	726	378	647	638	3062	100

5. Organic Matter

5.1 Homeowner Samples

Organic matter (loss-on-ignition method) in homeowner samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
Number	1	3	9	18	26	15	13	30	115
Percentage	1	3	8	16	23	13	11	26	100

	2002-2006
Lowest:	0.9
Highest:	14.9
Mean:	5.5
Median:	5.0

5.2 Commercial Samples

Organic matter (loss-on-ignition method) in commercial samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	6	6	128	164	194	105	35	35	673
2003	1	12	98	194	238	103	21	59	726
2004	0	4	42	113	146	53	9	11	378
2005	0	11	91	169	187	115	45	29	647
2006	1	2	113	218	213	60	15	16	638
Total	8	35	472	858	978	436	125	150	3062

	2002	2003	2004	2005	2006
Lowest:	0.7	0.8	1.1	1.6	0.5
Highest:	64.9	50.5	19.8	32.9	16.5
Mean:	5.7	6.1	4.2	4.5	4.0
Median:	4.1	4.2	4.1	4.3	3.9

Organic matter in commercial samples (% of total number of samples):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	1	1	19	24	29	16	5	5	100
2003	0	2	13	27	33	14	3	8	100
2004	0	1	11	30	39	14	2	3	100
2005	0	2	14	26	29	18	7	4	100
2006	0	0	18	34	33	9	2	3	100
Total	0	1	15	28	32	14	4	5	100

6. pH

6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
Number	0	2	5	14	14	18	31	23	8	0	115
Percentage	0	2	4	12	12	16	27	20	7	0	100

	2002-2006
Lowest:	4.8
Highest:	8.4
Mean:	-
Median:	7.1

6.2 Commercial Samples

pH of commercial samples (number):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	?	Total
2002	0	2	21	106	167	179	135	59	4	0	0	673
2003	9	6	28	85	169	223	154	39	0	0	13	726
2004	0	0	11	29	122	108	81	27	0	0	0	378
2005	0	4	24	124	193	168	99	33	2	0	0	647
2006	0	0	21	87	179	191	119	41	0	0	0	638
Total	9	12	105	431	830	869	588	199	6	0	13	3062

	2002	2003	2004	2005	2006
Lowest:	4.7	4.1	5.1	4.8	5.0
Highest:	8.2	7.9	7.9	8.0	7.9
Mean:	-	-	-	-	-
Median:	6.6	6.6	6.6	6.4	6.5

pH of commercial samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	?	Total
2002	0	0	3	16	25	27	9	1	0	0	0	100
2003	1	1	4	12	23	31	5	0	0	0	2	100
2004	0	0	3	8	32	29	7	0	0	0	0	100
2005	0	1	4	19	30	26	5	0	0	0	0	100
2006	0	0	3	14	28	30	6	0	0	0	0	100
Total	0	0	3	14	27	28	6	0	0	0	0	100

7. Phosphorus

7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
Number	0	30	18	20	10	10	7	5	2	13	115
Percentage	0	26	16	17	9	9	6	4	2	11	100

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002-2006
Lowest:	1
Highest:	653
Mean:	71
Median:	18

7.2 Commercial Samples

Phosphorus (lbs P/acre Morgan extraction) for commercial samples (number):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	?	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	-	
2002	0	213	150	241	23	7	8	10	3	18	0	673
2003	0	278	164	216	38	7	4	10	5	4	0	726
2004	0	141	103	115	14	1	2	1	0	1	0	378
2005	0	254	169	187	17	9	3	3	1	4	0	647
2006	0	245	182	167	14	3	3	2	0	3	19	638
Total	0	1131	768	926	106	27	20	26	9	30	19	3062

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	475	339	286	444	275
Mean:	22	15	11	13	10
Median:	7	5	5	5	5

Phosphorus in commercial samples (% of total number of samples):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	?	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	-	
2002	0	32	22	36	3	1	1	1	0	3	0	100
2003	0	38	23	30	5	1	1	1	1	1	0	100
2004	0	37	27	30	4	0	1	0	0	0	0	100
2005	0	39	26	29	3	1	0	0	0	1	0	100
2006	0	38	29	26	2	0	0	0	0	0	3	100
Total	0	37	25	30	3	1	1	1	0	1	1	100

VL = very low, L = low, M = medium, H = high, VH = very high.

8. Potassium

8.1 Homeowner Samples

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	1	12	14	28
Total (%)	0	4	4	43	50	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	1	9	19	30
Total (%)	0	3	3	30	63	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	1	6	7	10	24	48
Total (%)	2	13	15	21	50	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	1	4	3	0	1	9
Total (%)	11	44	33	0	11	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Rao, R., K. Evans, Q.M. Ketterings, and H. Krol (2007). Madison Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-25. 34 pages.

Potassium classification summary for homeowners:

Summary	Very Low	Low	Medium	High	Very High	Total
Number	2	12	12	31	58	115
Percentage	2	10	10	27	50	100

	2002-2006
Lowest:	54
Highest:	1412
Mean:	266
Median:	192

8.2 Commercial Samples

Potassium (lbs K/acre Morgan extraction) in commercial samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	1	1	2
2004	0	0	1	0	0	1
2005	0	0	0	1	0	1
2006	0	0	0	1	0	1
Total (#)	0	0	1	3	1	5
Total (%)	0	0	20	60	20	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	20	69	92	151	332
2003	1	54	59	104	138	356
2004	3	14	43	68	61	189
2005	2	13	47	84	105	251
2006	0	44	84	124	130	382
Total (#)	6	145	302	472	585	1510
Total (%)	0	10	20	31	39	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	6	42	65	67	106	286
2003	5	52	75	85	87	304
2004	2	15	39	54	50	160
2005	1	48	82	120	115	366
2006	2	44	78	67	59	250
Total (#)	16	201	339	393	417	1366
Total (%)	1	15	25	29	31	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	6	5	1	0	4	16
2003	6	10	3	4	1	24
2004	2	3	4	9	9	27
2005	3	13	8	4	0	28
2006	0	4	0	0	1	5
Total (#)	17	35	16	17	15	100
Total (%)	17	35	16	17	15	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	3	3	0	8
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	2	3	3	0	8
Total (%)	0	25	38	38	0	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	5	5	1	11	5	27
2003	0	2	3	14	20	39
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	5	7	4	25	25	66
Total (%)	8	11	6	38	38	100

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	17	74	139	173	266	4	673
2003	12	118	140	208	247	1	726
2004	7	32	87	131	120	1	378
2005	6	74	137	209	220	1	647
2006	2	92	162	192	190	0	638
Grand Total	44	390	665	913	1043	7	3062

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	3	11	21	26	40	1	100
2003	2	16	19	29	34	0	100
2004	2	8	23	35	32	0	100
2005	1	11	21	32	34	0	100
2006	0	14	25	30	30	0	100
Grand Total	1	13	22	30	34	0	100

	2002	2003	2004	2005	2006
Lowest:	26	33	20	38	41
Highest:	1922	2938	3629	2565	948
Mean:	201	187	175	187	161
Median:	147	135	137	140	121

9. Magnesium

9.1 Homeowner Samples

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Number	0	0	6	12	97	115
Percentage	0	0	5	10	84	100

	2002-2006
Lowest:	85
Highest:	1987
Mean:	478
Median:	445

9.2 Commercial Samples

Magnesium (lbs Mg/acre Morgan extraction) in commercial samples (number):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	7	6	117	543	673
2003	0	2	8	83	633	726
2004	0	4	3	58	313	378
2005	0	4	15	107	521	647
2006	0	4	29	110	495	638
Total	0	21	61	475	2505	3062

	2002	2003	2004	2005	2006
Lowest:	22	60	27	53	41
Highest:	1627	2475	18943	2755	2371
Mean:	404	442	430	404	383
Median:	312	377	336	318	336

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	1	17	81	100
2003	0	0	1	11	87	100
2004	0	1	1	15	83	100
2005	0	1	2	17	81	100
2006	0	1	5	17	78	100
Total	0	1	2	16	82	100

10. Iron

10.1 Homeowner Samples

Iron (lbs Fe/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
Summary	105	10	115

Percentages:

0-49	>49	Total
Normal	Excessive	
91	9	100

	2002
Lowest:	1
Highest:	222
Mean:	20
Median:	7

10.2 Commercial Samples

Iron (lbs Fe/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	663	10	673
2003	684	42	726
2004	368	10	378
2005	612	35	647
2006	614	24	638
Total	2941	121	3062

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	99	1	100
	94	6	100
	97	3	100
	95	5	100
	96	4	100
	96	4	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	126	870	374	780	166
Mean:	9	18	11	17	12
Median:	5	5	6	7	7

11. Manganese

11.1 Homeowner Samples

Manganese (lbs Mn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
Summary	107	8	115

Percentages:

0-49	>49	Total
Normal	Excessive	
93	7	100

	2002
Lowest:	13
Highest:	687
Mean:	59
Median:	47

11.2 Commercial Samples

Manganese (lbs Mn/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	664	9	673
2003	712	14	726
2004	375	3	378
2005	643	4	647
2006	637	1	638
Total	3031	31	3062

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	99	1	100
	98	2	100
	99	1	100
	99	1	100
	100	0	100
	99	1	100

	2002	2003	2004	2005	2006
Lowest:	7	3	10	7	6
Highest:	198	246	629	401	133
Mean:	33	29	31	29	29
Median:	29	25	26	26	27

12. Zinc

12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
Summary	3	14	98	115

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
3	12	85	100

	2002
Lowest:	0.3
Highest:	931.0
Mean:	15.3
Median:	3.3

12.2 Commercial Samples

Zinc (lbs Zn/acre Morgan extraction) in commercial samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	30	183	460	673
2003	26	209	491	726
2004	35	161	182	378
2005	93	187	367	647
2006	68	249	321	638
Total	252	989	1821	3062

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	27	68	100
4	29	68	100
9	43	48	100
14	29	57	100
11	39	50	100
8	32	59	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.1	0.1	0.1	0.1
Highest:	29.7	27.8	8.6	26.0	18.9
Mean:	2.2	2.2	1.2	1.5	1.3
Median:	1.3	1.4	1.0	1.2	1.1

Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
Alfalfa	
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
Birdsfoot	
BCE	Birdsfoot trefoil clover, Establishment
BCT	Birdsfoot trefoil clover, Established
BGE	Birdsfoot trefoil grass, Establishment
BGT	Birdsfoot trefoil grass, Established
BSE	Birdsfoot trefoil seed, Establishment
BST	Birdsfoot trefoil seed, Established
BTE	Birdsfoot trefoil, Establishment
BTT	Birdsfoot trefoil, Established
Barley	
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
Clover	
CGE	Clover grass, Establishment
CGT	Clover grass, Established
CLE	Clover, Establishment
CLT	Clover, Established
CSE	Clover seed production, Establishment
CST	Clover seed production, Established

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses, pastures, covercrops
CVE	Crownvetch, Establishment
CVT	Crownvetch, Established
GIE	Grasses intensively managed, Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats seeded with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
	Others
ALG	Azalea
APP	Apples
ATF	Athletic field

Crop Code	Crop Description
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing